Analysis of trans fatty acids in Denmark, industrially produced versus ruminant trans fatty acids

Bysted, Anette

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Trans fatty acids (TFA) occur naturally in dairy products and fats from ruminants as a result of bacterial bio hydrogenation (R-TFA). In addition, TFA are formed industrially by partial hydrogenation of unsaturated fatty acids from vegetable and marine oils (IP-TFA). The aim of this hydrogenation is to produce fats with improved oxidative and thermal stability as well as modified physical properties (e.g. raised solid fat contents and melting points).
IP-TFA can represent up to 60 g per 100 g fat in certain food samples, whereas the level of R-TFA is only up to 6 g per 100 g fat in e.g. dairy products and ruminant meat [1-3].

Legislation in Denmark

To eliminate the adverse health effects of IP-TFA, a Danish regulation specifying a maximum of 2 g IP-TFA per 100 g fat destined for human consumption was introduced from 1 January 2004 [4]. With that, Denmark became the first country to restrict the use of partially hydrogenated oils and fats.
For the purposes of this order, IP-TFA are defined as the sum of all isomers with one or more *trans* (methylene interrupted) double bonds originating from industrial production i.e. conjugated linoleic acid isomers are not included. Oils and fats of animal origin are excluded from the regulation. Consequently, there is a need for a method to distinguish between IP-TFA and R-TFA.

Analysis of TFA in foods on the Danish market

The content of fatty acids including TFA in foods on the Danish market is determined as described by Bysted et al. 2009 [5].
The foods can be classified according to the fat sources.
In foods with milk fat as the only fat source, the amount of total TFA equals the amount of R-TFA.
In foods based solely upon industrially produced fats, the content of total TFA equals the content of IP-TFA.
In foods containing mixed fats e.g. milk fat and partially hydrogenated soybean oil, the amount of R-TFA is calculated from the unique occurrence of butyric acid (C4:0) in milk fat and then withdrawn from the total amount of TFA to get the contribution from IP-TFA. This calculation is divided into three steps. First, the content of milk fat in the product is calculated based on the content of C4:0 in milk fat established to 3.6 g per 100 g fat. Then, the content of R-TFA is calculated based on the content of TFA in milk fat established to 6 g per 100 g fat.

REG-no. DK 30 06 09 46

Technical University of Denmark
National Food Institute
Mørkhøj Bygade 19
2860 Søborg
Denmark
Tel +45 35 88 70 00
Fax +45 35 88 70 01
anby@food.dtu.dk
www.food.dtu.dk

Finally, the content of R-TFA is subtracted from the total TFA content to give an estimate of the IP-TFA content.

References

[1] M. U. Jakobsen, A. Bysted, N. L. Andersen, B. L. Heitmann, H. B. Hartkopp, T. Leth, K. Overvad, J. Dyerberg: Intake of ruminant *trans* fatty acids and risk of coronary heart disease - An overview. *Atheroscler Suppl*. 2006, **7**, 9-11.

[2] T. Leth, L. Ovesen, K. Hansen: Fatty acid composition of meat from ruminants, with special emphasis on *trans* fatty acids. *J Am Oil Chem Soc*. 1998, **75**, 1001-1005.

[3] S. Stender, J. Dyerberg, A. Bysted, T. Leth, A. Astrup: A *trans* world journey. *Atheroscler Suppl*. 2006, **7**, 47-52.

[4] Danish Order No. 160 of 11 March 2003, with later amendments. *(Bekendtgørelse nr. 160 af 11. marts 2003 om indhold af transfedtsyrer i olier og fedtstoffer m.v., med senere ændringer).*

[5] A. Bysted, A. Æ. Mikkelsen, T. Leth: Substitution of *trans* fatty acids in foods on the Danish market. *Eur J Lipid Sci Technol*. 2009, **11**, 574-583.

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